

relative to the timing of dispersal. Our paper will focus on results of the first year of a 2-yr study.

DIURNAL ACTIVITIES OF MIGRATING JUVENILE RED-TAILED HAWKS

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From 1990–93, we studied fall movements of nine juvenile red-tailed hawks (*Buteo jamaicensis*) via radiotracking. Our tracking time for each bird ranged from 24 hr to 9 d (total days of tracking = 76). Birds were observed to begin soaring approximately 2.5 hr after sunrise with their directional flight commencing approximately 1 hr later. The day's directional flight ceased approximately 2 hr before sunset and soaring ceased 1.5 hr before sunset. The mean distance traveled from roost to roost was 65.3 km (range 12–198 km). Additionally, we were able to estimate the distance of the actual travel path (\bar{x} = 80.5 km, range 12–207 km). The estimated travel path averaged 20% greater than the roost to roost distance. The amount of time traveled each day ranged from 1.12–8.25 hrs (\bar{x} = 4.3 hrs). The average daily speed was 21 km/hr, and the maximum speed recorded was 78 km/hr.

HABITAT UTILIZATION BY BALD EAGLES WINTERING IN INDIANA

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Biweekly helicopter surveys of bald eagle (*Haliaeetus leucocephalus*) activity were conducted from November 1991 through April 1992, using 12 specific routes. The survey routes were characterized as to habitat usage by bald eagles through census and statistical determination of the most influential variables, of interface and creek mouths. Thirty-six habitat variables were noted and measured for 696 eagle sightings. Classification of priority management sites for Indiana was done based on the presence of high eagle use sites. As eagle nesting season was initiated, a substantial increase in sport fishing activity occurred at several sites, as did human activity—particularly on the reservoirs. Total eagle sightings peaked in late January. Immature and juvenile eagles were more easily flushed, while adults and subadult birds were more tolerant of helicopter disturbance. Habitat was segmented into 4-km segments, and analyzed for eagle usage. Waterfowl data and human and boat activity are also correlated with eagle occurrence. There is some evidence to suggest that eagles avoid areas of regular human disturbance, and aggregate in certain other areas. These include the Wabash River stretch near a power plant and protected areas on Monroe Reservoir. Trees selected as perch sites were most often deciduous trees, 6.5 m from the water's edge. Wintering eagles utilized large reservoirs more often than large rivers. There

is also some association between eagles utilizing segments with waterfowl present in peak winter months.

HOW TO MEASURE A HAWK MIGRATION—EVOLUTION OF THE QUADRANT SYSTEM AT THE GOLDEN GATE

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In the 1980s we were frustrated trying to apply historical hawk counting techniques to the autumn hawk flight over the Marin Headlands, just north of San Francisco, California. The conditions of the count site—steep topography, unpredictable fog, and lots of year-round raptor activity—necessitated that we develop a new system of counting as well as a new perspective on what we were measuring. In 1989, we began using a quadrant system to record daily rates of visible raptor activity for 19 species, with a primary goal of establishing a consistent and repeatable measure for use over the long-term. In use through 1993, the 4-mo count has yielded annual rates from 21.5–43.7 hawks per hour, corresponding with absolute counts ranging from 13 600–22 500 hawk-sightings. I will discuss the pros and cons of hawk counting systems, including the importance of defining specific counting techniques, assumptions, and units of measurement.

FAT CONTENT OF AMERICAN KESTRELS (*FALCO SPARVERIUS*) AND SHARP-SHINNED HAWKS (*ACCIPITER STRIATUS*) ESTIMATED BY TOTAL BODY ELECTRICAL CONDUCTIVITY

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Total body electrical conductivity (TOBEC) is a noninvasive method for the estimation of lean mass in live subjects. Lipid content can be calculated from the body mass measured and the lean mass estimated from TOBEC. We used live American kestrels (*Falco sparverius*) to study the accuracy of this method. TOBEC measurements were compared to actual body content determined by Soxhlet fat extraction using petroleum ether as the solvent. TOBEC estimated 73.7% of the variation in lean mass in a sample of 21 live kestrels and estimated 83.8% of the variation in lean mass for 21 kestrel carcasses warmed to 39.8°C. No significant difference was found between the slope or elevation of the calibration lines developed using live or dead kestrels. Body temperature altered the TOBEC measurements by an average of 1.54% (SE = 0.55) for each 1°C change over a temperature range of 7.0°C (37.3–44.4). The calibration developed for kestrels was used to estimate lean mass and compute fat mass of migrating kestrels, sharp-shinned hawks (*Accipiter striatus*) and merlins (*Falco columbarius*). The average percent fat mass of kestrels trapped during migration at Cape May, New Jersey, was 6.01% (SE = 1.92, N = 12) for males